I/WE CLAIM:

1. A method of operating a combustor for a gas turbine engine over an entire operating range thereof at high engine efficiency, while minimizing emissions of nitrogen oxides NO_x and carbon monoxide CO from the engine, comprising:

under low load conditions supplying a fuel and an air flow to a Dry-Low-Emissions (DLE) combustion system of the combustor to generate combustion products;

under high load conditions stopping the fuel and air flow to a DLE combustion and supplying a fuel and air flow to a Catalyst (CAT) combustion system of the combustor to generate combustor products; and

the low and high load conditions being defined by a predetermined power level, the predetermined power level being associated with an adequate catalyst inlet temperature so that the combustion procedure of the combustor switches over from the DLE combustion system to the CAT combustion system when the adequate catalyst inlet temperature can be achieved, resulting from increasing of an engine power level.

2. A method as claimed in claim 1 wherein the catalyst inlet temperature is controlled within catalyst operating conditions for engine loads between the predetermined power level and the full load condition by adjusting air flow to the CAT combustion system.

3. A method as claimed in claim 1 wherein the catalyst inlet temperature is controlled within catalyst

operating conditions for engine loads between the predetermined power level and the full load condition by adding heat to the CAT combustion system from combustor cooling heat transfer.

4. A method as claimed in claim 1 wherein the combustion products from either one of the DLE and CAT combustion systems are maintained in the combustor for an extended residence time to convert CO formed in the combustion products to CO_2.

5. A method of operating a combustor for a gas turbine engine under engine operating conditions from idle to full load at high engine efficiency while minimizing emissions of nitrogen oxides NO_x and carbon monoxide CO from the engine, comprising:

incorporating a Dry-Low-Emissions (DLE) combustion system and a Catalyst (CAT) combustion system into the combustor;

providing an air control system and a fuel injection system for supplying fuel and air flow to the DLE combustion system to generate combustion products under low load conditions, and for supplying fuel and air flow to the CAT combustion system to generate combustor products under high load conditions; and

providing a control means for switching over the combustion procedure of the combustor from the DLE combustion system to the CAT combustion system when an adequate catalyst inlet temperature can be achieved, resulting from increasing engine power level.

6. A method as claimed in claim 5 wherein the fuel injection system is adapted to supply gaseous fuel to the CAT combustion system and both gaseous and liquid fuel to the DLE combustion system.

7. A low-emissions combustion system for a gas turbine engine comprising:

a Dry-Low-Emissions (DLE) combustion sub-system for generating combustion products under a lean premixed fuel/air condition;

a Catalyst (CAT) combustion sub-system for generating combustion products under a lean premixed fuel/air condition in the presence of a catalyst;

a combustor scroll connected to the DLE and CAT combustion sub-systems for delivering the combustion products in adequate inlet conditions to an annular turbine of the engine;

a fuel injection sub-system for injecting fuel into the respective DLE and CAT combustion sub-systems;

an air supply sub-system for supplying air to the respective DLE and CAT combustion sub-systems; and

a control sub-system for controlling the fuel injection and air supply sub-systems to selectively inject fuel and selectively supply air to the respective DLE and CAT combustion sub-systems.

8. A low-emissions combustion system as claimed in claim 7 wherein the combustor scroll includes a transition section and is connected through the

transition section to both the DLE and CAT combustion sub-systems.

9. A low-emissions combustion system as claimed in claim 7 wherein the fuel injection and air supply sub-systems are controlled to selectively inject fuel and supply air only to the DLE combustion sub-system when the engine is operated under low load conditions, and to selectively inject fuel and supply air only to the CAT combustion sub-system when the engine is operated under high load conditions.

10. A low-emissions combustion system as claimed in claim 7 wherein the control sub-system includes temperature sensing means for measuring compressor discharge air temperature, and is adapted to switch the fuel injection and the air supply from the DLE combustion sub-system to the CAT combustion sub-system when the compressor discharge air temperature reaches a predetermined level to ensure an adequate catalyst inlet temperature.

11. A low-emissions combustion system as claimed in claim 7 wherein the fuel injection sub-system is adapted to selectively inject gaseous and liquid fuel into the DLE combustion sub-system.

12. A low-emissions combustion system as claimed in claim 7 wherein the fuel injection sub-system is adapted to inject gaseous fuel into the CAT combustion sub-system.

13. A low-emissions combustion system as claimed in claim 7 wherein the air supply sub-system includes a

by-pass passage for permitting compressor discharge air to controllably by-pass the DLE and CAT combustion sub-systems to ensure that an adequate fuel/air ratio of the fuel/air mixture entering DLE and CAT combustion sub-systems is independent from engine operating conditions.